



Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at <http://about.jstor.org/participate-jstor/individuals/early-journal-content>.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact support@jstor.org.

REVIEWS

Kakabikansing. By J. V. BROWER. St. Paul, Minn.: H. L. Collins & Co.

UNDER this bizarre title Mr. Brower has described the occurrence of quartz chippings at Little Falls, Minn., prefixing a sketch of the previous studies of Winchell, Babbitt, Upham, Hill, Holmes, and Hershey, and affixing a letter from Professor Winchell and a statement on "Primitive Man in the Ice Age" by Mr. Warren Upham. The descriptions of Mr. Brower are apparently careful and candid, so far as intention goes, but they are obviously not those of a critical geological observer. They neglect most of the really discriminative factors and embrace much inconsequential matter. Notably also they have the trait, so common to the untrained worker, of incorporating interpretation unconsciously while insisting on "ascertained facts." "The glacial river" plays a notable part in the description of the formations, whereas the very thing to be demonstrated is the "glacial" or non-glacial character of the river at the time the formations in question were made. None the less the excellent photographs and the maps, together with the statement of Professor Winchell, largely supply the lacking data and make it possible to consider whether the interpretations put upon them are the normal ones or not.

From these it appears that there overspreads the plain once occupied by the Mississippi waters, but now above their reach, a surface layer of dirty pebbly sand of the typical structureless kind which usually covers abandoned flood plains of sand and gravel. This is about four feet thick and at places near the river contains many chips of white vein quartz of undoubted human origin. The source of the quartz is unquestionably the veins in the outcropping slate over which the falls are formed. This quartz-bearing slate does not now rise as high as the upper surface of the plain, and this fact has been urged by Holmes and Hershey as evidence that the quartz chippings were not taken from the parent ledge until the plain had been cut down to the requisite depth after its original completion. Mr. Brower, while not answering this objection by positive evidence, holds that the crest of the quartz-bearing ledge was exposed at seasons of low water, though

covered at times of flood. It is of course probable that the crest of the ledge has been worn down where the river flows over it, but such erosive covering by the river does not fit in well with the view that this same portion was the source whence large quantities of vein quartz were quarried at the same time. It is clearly urging a bare possibility at best rather than a probable occurrence.

If, however, the case rested merely on the possibility of reaching the source of the quartz while yet the uppermost layers of the original plain were in the process of formation, it might be ungenerous to refuse to entertain the utmost possibilities of the case in favor of glacial man in America. But the facts of the case, taken just as given in this paper, do not seem to the reviewer to afford even a plausible ground for assigning the quartz chips to the glacial stage of the river. The surface deposit in which they are found, as described and illustrated in the paper, not only does not bear the characteristics of a glacio-fluvial deposit, but bears quite clear evidence that it is not glacio-fluvial. The descriptions cite the fact that the surface deposit is highest near the bank of the present bottoms, after the common habit of existing degrading rivers. This habit is recognized and the facts are summarized in the following quotation (p. 73): "At Little Falls, Minn., the eastern portion of the sandy plain on the east side of the Mississippi is several feet lower than the crest of the plain at the east end of the dam. That fact is important. After the great glacial river which overspread the entire plain at Little Falls had withdrawn into the narrower limits of an eroded streambed, that river, often in freshet from the effects of the melting ice-sheet, occasionally re-overflowed the entire plain, disturbing and overturning the sandy surface, mixing into its materials every chipped quartz blade or spall which had been placed by the hand of man upon the surface adjoining the newly eroded and narrower channel. The higher altitudes of the plain along the Mississippi between 'The Notch' and the dam were caused by successive stages of recurring overflowage, creating additional surface deposits upon the plain nearest to the newly formed river bank." This is indeed "important," as the author himself naïvely remarks, since it shows, as the author also recognizes with equal unconsciousness of its real meaning, that it is the characteristic action of streams of *the present non-glacial régime*. It is here recognized, with undoubted correctness, that the quartzes were buried "by disturbing and overturning the sandy surface" and by "additional surface deposits." The reference of this, however, to *glacial* waters is

wholly without evidence and quite against the probabilities. Glacial streams as a rule have the aggrading habit, and are not therefore "withdrawn into the narrower limits of an eroded streambed," but on the contrary, are constantly shifting their courses from one point to another across their whole plain. Usually they subdivide into a complex plexus of numerous shallow shifting branches. There is therefore no reason whatever to suppose that the present channel of the Mississippi at Little Falls was in existence, even in its initial stages, while the river remained truly a glacial stream. The fact that the relic-bearing deposit is closely related to the present stream is *evidence that it was postglacial*. The deposit that carries the relics supports the same view, for it bears the characteristics of a postglacial rather a glacial formation. On the evidence submitted, therefore, in the paper the inference is rather imperative that the quartz chips were buried at some stage when postglacial rather than glacial conditions prevailed. To make this more clear, it may be worth while to sketch the normal succession of events and to gather from these the normal interpretation of the time and mode of burial of the quartz chips, assuming, as everywhere throughout this review, the complete trustworthiness of the evidence given in the paper, especially that afforded by its excellent photographic illustrations.

1. During the time the glacial border lay across the sources of the Mississippi and it was therefore truly a glacial stream, the normal inference is that it had the aggrading habit because of its overburden of glacial detritus; that it took the form of a plexus of numerous branchlets, and that it occupied, by the constant shifting of these, the whole plain which it was engaged in building up. In the nature of the case it should normally have no fixed channel nor any permanent flood plain deposit, since its whole plain was periodically covered by the channels of the branching and shifting streams. Its typical deposits should have been clean, fresh, well-assorted stratified sands and gravels. Any human relics left anywhere on the plain, even on portions not at the time occupied by the stream, should have been worked over and incorporated more or less deeply by scour-and-fill in the clean, stratified gravels and sands. None such are reported.

2. When the glacier had retired from the basin and no longer overloaded the Mississippi with its detritus, a transition stage should naturally have followed. During this the first work was to adjust the stream to the conditions that immediately followed the glacial retreat. It is to be presumed that the upper branches of the river were aggraded

to different slopes, dependent on their relations to the glacial supply of detritus thrown into them. As a rule, the gradient is much higher near the ice edge than at a distance from it. These high gradients are presumably the first to be reduced, while the material so derived is shifted to the lower gradients which continue their aggradation until the whole becomes adjusted to the new conditions. It must also be considered whether the fresh drift surfaces left by the recent retreat of the ice and the numerous new trenches of the young streams engaged in developing the new drainage system may not have kept the Mississippi in an aggrading, or at least static condition for a notable period after the direct influence of the ice sheet was withdrawn. Any human relics left on the plain during this stage should normally have been subject to incorporation by scour-and-fill in the clean, fresh, stratified gravel. But none are reported.

3. After the stage of transition had passed and the Mississippi had assumed the degradational phase, a period must probably be recognized during which its shifting meanders occupied the whole of its plain—except occasional protected embayments—and degraded it from side to side, removing the whole surface of the previous glacio-fluvial and transitional-adjustment plain. This action is dependent on the balance of prevailing conditions, and these vary for different rivers and different portions of the same river. To a large extent, the Mississippi has continued action of this phase down to the present time and has cut away the whole of the upper part of the glacio-fluvial plain. It is only here and there in favored localities that any remnants that can with probability be regarded as portions of the upper glacio-fluvial plain can now be recognized at any great distance from the ice edge. Just how long the river would continue to occupy by its shifting courses the whole upper plain at Little Falls cannot be determined by any evidence given in the paper, but the stage should be recognized in the interpretation of the history of the region, and particularly in the determination of the age of the surface deposits of the plain as it now exists. Any human relics left on the plain in this stage would be liable to be incorporated in the clean stratified gravel by scour-and-fill. But none are reported.

4. After the stages above noted had passed, the river developed a more restricted track and limited its erosion essentially to this, sinking its channel gradually into the broad plain and covering the remainder only in flood time. It would continue to flood the upper plain until the channel reached a depth greater than the height of the flood stages.

What this height is habitually in this part of the Mississippi is not known to the reviewer. The range between low and high water is given by Abbott as twenty feet at St. Paul, thirty-five feet at the mouth of the Missouri, and fifty feet at some points below. From the data given in the paper, it would appear that in the natural river, before influenced by damming, the low water was from twenty to twenty-five feet below the main plain. If, therefore, an average flood stage were applicable to this locality, the deepening of the channel since the river floods rose to the plain could be estimated at only a few feet, but the barrier formed by the slate renders an estimate of the time very uncertain. If the slate were once much higher than now, it should have kept the river longer within reach of the plain at flood time, so that the hypothesis that the slate has been notably cut down by the river, introduced to avoid the criticisms of Holmes and Hershey, is not without its embarrassments in another direction.

Now, it seems clear from the evidence presented in the paper that the quartz chips were not spread over the plain while the clean stratified gravels were being formed, nor while the river was meandering over the plain in its transitional-adjustment stage, nor in its general degradational stage, for at all of these stages, scour-and-fill should have incorporated the chips in the stratified sands and gravels. The chips were quite clearly introduced after the Mississippi had "withdrawn into the narrower limits of an eroded stream bed" and while only its flood stages overflowed the upper plain. This normally occurred in the fourth stage sketched above. As the recent cutting down of the channel has been slow on account of the slate barrier, a very considerable period has probably elapsed since the Mississippi last reached the upper plain even in its highest flood stages, except as these might be made exceptional by ice jams and similar obstructions. This gives the origin of the chips a respectable antiquity, but does not offer any presumption that it fell within the glacial period, or even very near its close. This seems to the reviewer to be the normal interpretation of the evidence presented in the paper.

T. C. C.